Large-Scale Demonstration & Deployment D&D

Los Alamos
NATIONAL LABORATORY
Environmental Science and Waste Technology

TECHNICAL DEMONSTRATION SUMMARY SHEET; Mobile Characterization Services Large Box RTR

MCS Large Box RTR Trailer

Standard Waste Box being trolleyed into trailer

Summary
The Integrating Contractor Team of the Los Alamos National Laboratory (LANL) Large Scale Demonstration and Deployment Project (LSDDP) demonstrated a system for real time radiography (RTR) of large boxes. The system was operated by Mobile Characterization Services (MCS). The demonstration was supported by DOE's Deactivation and Decommissioning Focus Area at the National Energy Technology Laboratory. The demonstration showed that the technology is capable of providing detailed images of small items and containerized liquids in large waste crates and containers.

The Need
Los Alamos National Laboratory is currently retrieving previously packaged oversized metal objects for processing and repackaging to meet the requirements for disposal at the LANL Solid Waste Disposal Area as low-level waste or for shipment to the Waste Isolation Pilot Plant for disposal as transuranic waste. Items such as gloveboxes, equipment, filters, and miscellaneous trash were packaged in fiberglass-reinforced plywood crates in the 1970s. The contents of each crate and their orientation within the crate are not known in detail. The MCS large box RTR system provides a means to non-invasively image the crate contents prior to crate disassembly. This imaging would support improved planning and safety for subsequent crate opening, processing and repackaging.

The Technology
The MCS operated large box RTR system is a VJ Technologies x-ray imaging system to non-intrusively image the contents of waste storage crates and containers. The unit is similar to drum RTR systems for certification of waste packages for the DOE's Waste Isolation Pilot Plant. The large box RTR system is housed in a semi-trailer that weighs approximately 100,000 lbs. To image a waste crate, it is loaded onto a turntable trolley conveyor system attached to the trailer and moved into the lead shielded x-ray vault inside the trailer. The combination of the moving trolley conveyor and the elevation control on the x-ray system facilitates imaging of the entire box from top to bottom and end to end. The maximum container size accepted is 113-inches long by 77-inches wide and 77-inches tall.

Once a container is in the vault, the doors are closed and x-ray generation is initiated. X-rays are produced in the x-ray tube head and are directed through the box to an image intensifier. Up to 450 Kv power is supplied to the x-ray tube, the exact power requirements are determined by the penetrating power needed

Los Alamos LSDDP web site address; http://www-emtd.lanl.gov/LSDDP/DDtech.html

by the waste package and contents. The image intensifier converts the x-ray image to a visible light image which is displayed on a video monitor. The video system includes a videotape cassette recorder (S-VHS), and an alpha-numeric character generating drive for text narrative.

The combination of the moving trolley conveyor and the elevation control on the x-ray system facilitates imaging of the entire waste container from top to bottom and end to end. The system output is a video recording and associated descriptive narrative of the image as the x-ray head proceeds across and down the container. The system images approximately a 6 inch segment at any instant. Large crates and packages are imaged from both sides. Small containers or containers with simple contents, such as filters, are imaged from only one side.

The Demonstration

The Mobile Characterization Services Large Box RTR system was demonstrated at the LANL Solid Waste Disposal area in January 2000. LANL radiation control technicians surveyed the system for potential radiation leakage prior to introduction of any waste crates or boxes. Twenty pre-selected containers and items were imaged during the demonstration. The containers included Fiberglass Reinforced Plywood crates, metal Standard Waste Boxes and one unknown metal cylinder provided by the LANL waste operations staff. The containers were transported to the RTR trailer using a truck or fork lift. The fork lift placed the containers on the RTR system trolley, and the MCS technicians then initiated imaging. LANL radiation control technicians surveyed the fork lift and trolley after each container was imaged and found no contamination. Integrating Contractor Team test engineers acted as data compilers and reviewers for the demonstration.

The Results

The MCS RTR unit provided detailed images of the contents of all containers and packages. Items such as plastic bagging, nails in crate construction, electrical connectors, wiring, piping, and fittings were clearly visible. Large metal items were easily located and their position and general shape was understood. Once the crate was positioned on the RTR trolley, it took from 15 58 minutes to image the entire container. The time required for imaging is dependent on both the size of the package and its contents. Crates of filter media required much less detail to review than crates or containers of complex items and miscellaneous trash.

A particularly significant result of the demonstration was the identification of a vessel that contained several gallons of liquid. This result was unexpected and showed a clear benefit of this type of characterization of the waste crates. An aerosol can was also located in a container of mixed trash. The unknown cylinder was found to contain an apparent source. These results have already impacted the management of these items in the LANL system.

Future Applicability

It has been reported that DOE has over 30,000 boxes and containers of waste in inventory and most of these must be characterized and repackaged prior to disposal. This RTR technology will provide a substantial risk reduction in processing the boxes and containers that meet the size capabilities.

Benefits

- Identifies non-compliant items in containers
- Capable of scanning several containers per hour
- Provides information for the best location to open the crates or containers
- Provides inventory reconciliation

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